

Human

Humans (*Homo sapiens*) are highly intelligent primates that have become the dominant species on Earth. They are the only extant members of the subtribe *Hominina* and together with chimpanzees, gorillas, and orangutans, they are part of the family *Hominidae* (the great apes, or *hominids*). Humans are terrestrial animals, characterized by their erect posture and bipedal locomotion; high manual dexterity and heavy tool use compared to other animals; open-ended and complex language use compared to other animal communications; larger, more complex brains than other primates; and highly advanced and organized societies.^{[3][4]}

Early hominins—particularly the *australopithecines*, whose brains and anatomy are in many ways more similar to ancestral non-human apes—are less often referred to as "human" than hominins of the genus *Homo*.^[5] Several of these hominins used fire, occupied much of Eurasia, and the lineage that later that gave rise to *Homo sapiens* is thought to have diverged in Africa from other known hominins around 500,000 years ago, with the earliest fossil evidence of *Homo sapiens* appearing (also in Africa) around 300,000 years ago.^[6] The oldest early *H. sapiens* fossils were found in Jebel Irhoud, Morocco dating to about 315,000 years ago.^{[7][8][9][10][11]} As of 2017, the oldest known skeleton of an anatomically modern *Homo sapiens* is the Omo-Kibish I, dated to about 196,000 years ago and discovered in southern Ethiopia.^{[12][13][14]} Humans began to exhibit evidence of behavioral modernity at least by about 100,000–70,000 years ago^{[15][16][17][18][19][20]} and (according to recent evidence) as far back as around 300,000 years ago, in the Middle Stone Age.^{[21][22][23]} In several waves of migration, *H. sapiens* ventured out of Africa and populated most of the world.^{[24][25]}

The spread of the large and increasing population of humans has profoundly affected much of the biosphere and millions of species worldwide. Advantages that explain this evolutionary success include a larger brain with a well-developed neocortex, prefrontal cortex and temporal lobes, which enable advanced abstract reasoning, language, problem solving, sociality, and culture through social learning. Humans use tools more frequently and effectively than any other animal: they are the only extant species to build fires, cook food, clothe themselves, and create and use numerous other technologies and arts.

Humans uniquely use such systems of symbolic communication as language and art to express themselves and exchange ideas, and also organize themselves into purposeful groups. Humans create

Human^[1]

Temporal range: 0.35–0 Ma

PreЄ

Є

OS

D

C

P

T

J

K

PgN

Middle Pleistocene – Recent



An adult human male (left) and female (right) from the Akha tribe in Northern Thailand.

Conservation status

Extinct

Threatened

Least Concern

EX

EW

CR

EN

VU

NT

LC

Least Concern (IUCN 3.1)^[2]

Scientific classification

Kingdom:

Animalia

Phylum:

Chordata

Class:

Mammalia

Order:

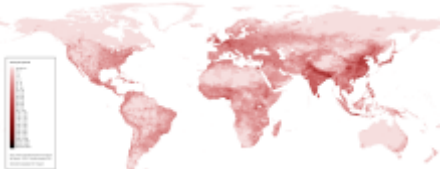
Primates

Suborder:

Haplorhini

complex social structures composed of many cooperating and competing groups, from families and kinship networks to political states. Social interactions between humans have established an extremely wide variety of values,^[26] social norms, and rituals, which together undergird human society. Curiosity and the human desire to understand and influence the environment and to explain and manipulate phenomena (or events) have motivated humanity's development of science, philosophy, mythology, religion, and numerous other fields of knowledge.

Though most of human existence has been sustained by hunting and gathering in band societies,^[27] many human societies transitioned to sedentary agriculture approximately 10,000 years ago,^[28] domesticating plants and animals, thus enabling the growth of civilization. These human societies subsequently expanded, establishing various forms of government, religion, and culture around the world, and unifying people within regions to form states and empires. The rapid advancement of scientific and medical understanding in the 19th and 20th centuries permitted the development of fuel-driven technologies and increased lifespans, causing the human population to rise exponentially. The global human population was estimated to be near 7.8 billion in 2019.^[29]

Infraorder:	Simiiformes
Family:	Hominidae
Subfamily:	Homininae
Tribe:	Hominini
Genus:	<i>Homo</i>
Species:	<i>H. sapiens</i>
Binomial name	
<i>Homo sapiens</i> <div>Linnaeus, 1758</div>	
Subspecies	
<div><div>■ †<i>Homo sapiens idaltu</i> White et al., 2003</div><div>■ <i>Homo sapiens sapiens</i></div></div>	
	
<i>Homo sapiens</i> population density	
Synonyms	
Species synonymy ^[1]	
<div><div>■ <i>aethiopicus</i><div>Bory de St. Vincent, 1825</div></div><div>■ <i>americanus</i><div>Bory de St. Vincent, 1825</div></div><div>■ <i>arabicus</i><div>Bory de St. Vincent, 1825</div></div><div>■ <i>aurignacensis</i><div>Klaatsch & Hauser, 1910</div></div><div>■ <i>australasicus</i><div>Bory de St. Vincent, 1825</div></div><div>■ <i>cafer</i><div>Bory de St. Vincent, 1825</div></div><div>■ <i>capensis</i><div>Broom, 1917</div></div><div>■ <i>columbicus</i><div>Bory de St. Vincent, 1825</div></div></div>	

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Etymology and definition

In common usage, the word "human" generally refers to the only extant species of the genus *Homo*—anatomically and behaviorally modern *Homo sapiens*.

In scientific terms, the meanings of "hominid" and "hominin" have changed during the recent decades with advances in the discovery and study of the fossil ancestors of modern humans. The previously clear boundary between humans and apes has blurred, resulting in biologists now acknowledging the hominids as encompassing multiple species, and *Homo* and close relatives since the split from chimpanzees as the only hominins. There is also a distinction between anatomically modern humans and *Archaic Homo sapiens*, the earliest fossil members of the species.

The English adjective *human* is a Middle English loanword from Old French *humain*, ultimately from Latin *hūmānus*, the adjective form of *homō* "man." The word's use as a noun (with a plural: *humans*) dates to the 16th century.^[30] The native English term *man* can refer to the species generally (a synonym for *humanity*) as well as to human males, or individuals of either sex (though this latter form is less common in contemporary English).^[31]

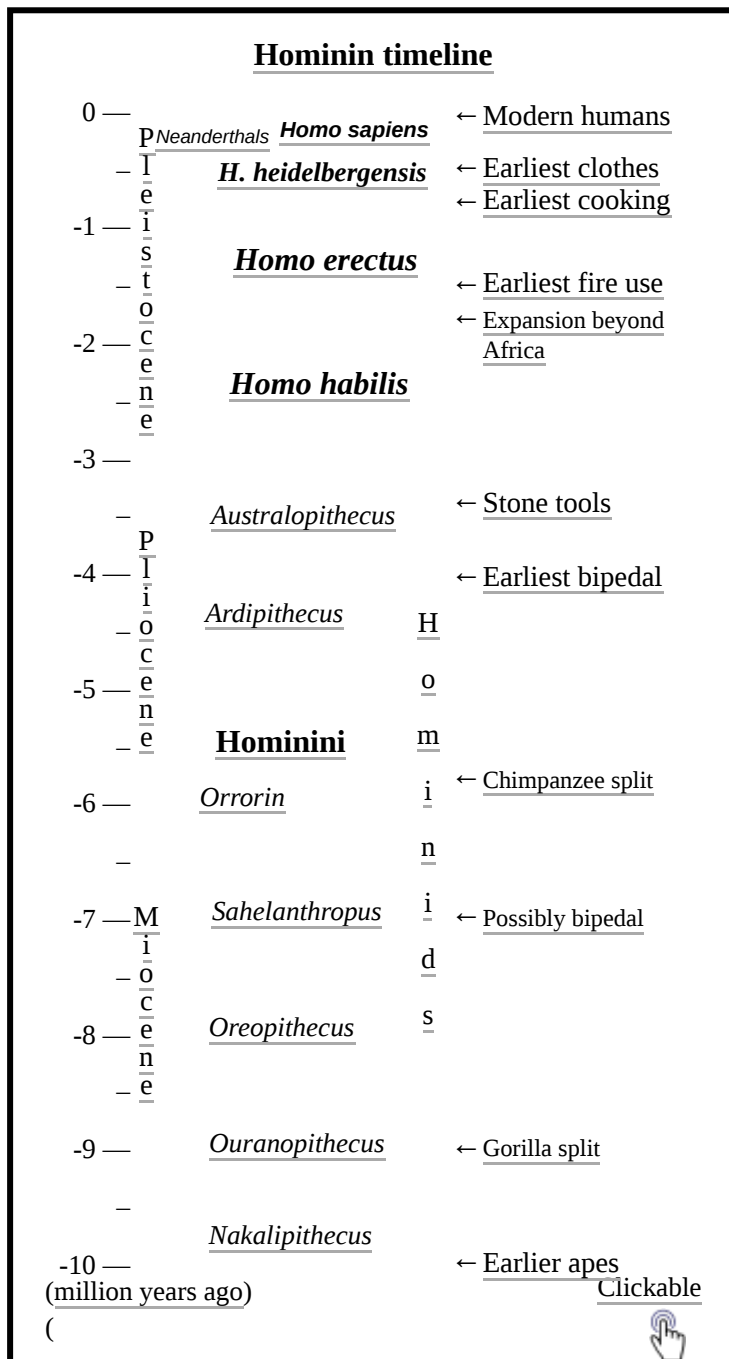
The species binomial "*Homo sapiens*" was coined by Carl Linnaeus in his 18th-century work *Systema Naturae*.^[32] The generic name "*Homo*" is a learned 18th-century derivation from Latin *homō* "man," ultimately "earthly being" (Old Latin *hemō* a cognate to Old English *guma* "man", from PIE *d^hǵ^hmon-*,

- *cro-magnonensis*
Gregory, 1921
- *drennani*
Kleinschmidt, 1931
- *euraficanus*
(Sergi, 1911)
- *grimaldiensis*
Gregory, 1921
- *grimaldii*
Lapouge, 1906
- *hottentotus*
Bory de St. Vincent, 1825
- *hyperboreus*
Bory de St. Vincent, 1825
- *indicus*
Bory de St. Vincent, 1825
- *japeticus*
Bory de St. Vincent, 1825
- *melaninus*
Bory de St. Vincent, 1825
- *monstrosus*
Linnaeus, 1758
- *neptunianus*
Bory de St. Vincent, 1825
- *palestinus*
McCown & Keith, 1932
- *patagonus*
Bory de St. Vincent, 1825
- *priscus*
Lapouge, 1899
- *proto-aethiopicus*
Giuffrida-Ruggeri, 1915
- *scythicus*
Bory de St. Vincent, 1825
- *sinicus*
Bory de St. Vincent, 1825

meaning "earth" or "ground").^[33] The species-name "*sapiens*" means "wise" or "sapient". Note that the Latin word *homo* refers to humans of either sex, and that "*sapiens*" is the singular form (while there is no such word as "*sapien*").^[34]

History

- *spelaeus*
Lapouge, 1899
- *trogloodytes*
Linnaeus, 1758
- *wadjakensis*
Dubois, 1921

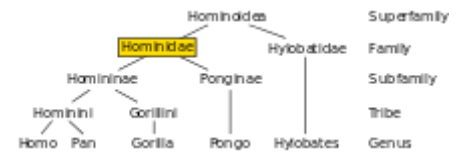


Evolution and range

The genus *Homo* evolved and diverged from other hominins in Africa, after the human clade split from the chimpanzee lineage of the hominids (great apes) branch of the primates. Modern humans, defined as the species *Homo sapiens* or specifically to the single extant subspecies *Homo sapiens sapiens*, proceeded to colonize all the continents and larger islands, arriving in Eurasia 125,000–60,000 years ago,^{[35][36]} Australia around 40,000 years ago, the Americas around 15,000 years ago, and remote islands such as Hawaii, Easter Island, Madagascar, and New Zealand between the years 300 and 1280.^{[37][38]}

Evidence from molecular biology

The closest living relatives of humans are chimpanzees and bonobos (genus *Pan*)^{[39][40]} and gorillas (genus *Gorilla*).^[41] With the sequencing of human and chimpanzee genomes, current estimates of similarity between human and chimpanzee DNA sequences range between 95% and 99%.^{[41][42][43]} By using the technique called a molecular clock which estimates the time required for the number of divergent mutations to accumulate between two lineages, the approximate date for the split between lineages can be calculated. The gibbons (family Hylobatidae) and orangutans (genus *Pongo*) were the first groups to split from the line leading to the humans, then gorillas (genus *Gorilla*) followed by the chimpanzee (genus *Pan*). The splitting date between human and chimpanzee lineages is placed around 4–8 million years ago during the late Miocene epoch.^{[44][45]} During this split, chromosome 2 was formed from two other chromosomes, leaving humans with only 23 pairs of chromosomes, compared to 24 for the other apes.^[46]



Family tree showing the extant hominoids: humans (genus *Homo*), chimpanzees and bonobos (genus *Pan*), gorillas (genus *Gorilla*), orangutans (genus *Pongo*), and gibbons (four genera of the family Hylobatidae: *Hylobates*, *Hoolock*, *Nomascus*, and *Symphalangus*). All except gibbons are hominids.

Evidence from the fossil record

There is little fossil evidence for the divergence of the gorilla, chimpanzee and hominin lineages.^{[47][48]} The earliest fossils that have been proposed as members of the hominin lineage are *Sahelanthropus tchadensis* dating from 7 million years ago, *Orrorin tugenensis* dating from 5.7 million years ago, and *Ardipithecus kadabba* dating to 5.6 million years ago. Each of these species has been argued to be a bipedal ancestor of later hominins, but all such claims are contested. It is also possible that any one of the three is an ancestor of another branch of African apes, or is an ancestor shared between hominins and other African Hominoidea (apes). The question of the relation between these early fossil species and the hominin lineage is still to be resolved. From these early species the australopithecines arose around 4 million years ago diverged into robust (also called *Paranthropus*) and gracile branches,^[49] possibly one of which (such as *A. garhi*, dating to 2.5 million years ago) is a direct ancestor of the genus *Homo*.^[50]

The earliest members of the genus *Homo* are *Homo habilis* which evolved around 2.8 million years ago.^[51] *Homo habilis* has been considered the first species for which there is clear evidence of the use of stone tools. More recently, however, in 2015, stone tools, perhaps predating *Homo habilis*, have been discovered in northwestern Kenya that have been dated to 3.3 million years old.^[52] Nonetheless, the brains of *Homo habilis* were about the same size as that of a chimpanzee, and their main adaptation was bipedalism as an adaptation to terrestrial living. During the next million years a process of encephalization began, and with the arrival of *Homo erectus* in the fossil record, cranial capacity had doubled. *Homo erectus* were the first of the hominina to leave Africa, and these species spread through Africa, Asia, and Europe between 1.3 to 1.8 million years ago. One population of *H. erectus*, also sometimes classified as a separate species *Homo ergaster*, stayed in Africa and evolved into *Homo sapiens*. It is believed that these species were the first to use fire and complex tools. The earliest transitional fossils between *H. ergaster/erectus* and archaic humans are from Africa such as *Homo rhodesiensis*, but seemingly transitional forms are also found at Dmanisi, Georgia. These descendants of African *H. erectus* spread through Eurasia from c. 500,000 years ago evolving into *H. antecessor*, *H. heidelbergensis* and *H. neanderthalensis*. Fossils of anatomically modern humans from date from the Middle Paleolithic at about 200,000 years ago such as the Omo remains of Ethiopia, and the fossils of Herto sometimes classified as *Homo sapiens idaltu* also from Ethiopia. Earlier remains, now classified as early *Homo sapiens*, such as the Jebel Irhoud remains from Morocco and the

Florisbad Skull from South Africa are also now known to date to about 300,000 and 259,000 years old respectively.^{[53][6][54][55][56][57]} Later fossils of archaic *Homo sapiens* from Skhul in Israel and Southern Europe begin around 90,000 years ago.^[58]

Anatomical adaptations

Human evolution is characterized by a number of morphological, developmental, physiological, and behavioral changes that have taken place since the split between the last common ancestor of humans and chimpanzees. The most significant of these adaptations are 1. bipedalism, 2. increased brain size, 3. lengthened ontogeny (gestation and infancy), 4. decreased sexual dimorphism (neoteny). The relationship between all these changes is the subject of ongoing debate.^[59] Other significant morphological changes included the evolution of a power and precision grip, a change first occurring in *H. erectus*.^[60]

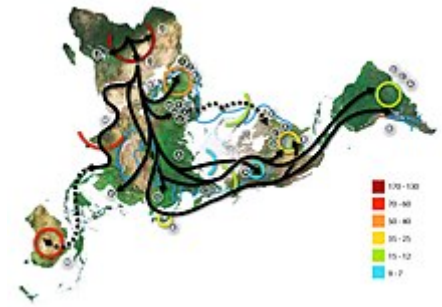
Bipedalism is the basic adaption of the hominin line, and it is considered the main cause behind a suite of skeletal changes shared by all bipedal hominins. The earliest bipedal hominin is considered to be either *Sahelanthropus*^[61] or *Orrorin*, with *Ardipithecus*, a full bipedal,^[62] coming somewhat later. The knuckle walkers, the gorilla and chimpanzee, diverged around the same time, and either *Sahelanthropus* or *Orrorin* may be humans' last shared ancestor with those animals. The early bipedals eventually evolved into the australopithecines and later the genus *Homo*. There are several theories of the adaptational value of bipedalism. It is possible that bipedalism was favored because it freed up the hands for reaching and carrying food, because it saved energy during locomotion, because it enabled long-distance running and hunting, or as a strategy for avoiding hyperthermia by reducing the surface exposed to direct sun.

The human species developed a much larger brain than that of other primates—typically 1,330 cm³ (81 cu in) in modern humans, over twice the size of that of a chimpanzee or gorilla.^[63] The pattern of encephalization started with *Homo habilis* which at approximately 600 cm³ (37 cu in) had a brain slightly larger than chimpanzees, and continued with *Homo erectus* (800–1,100 cm³ (49–67 cu in)), and reached a maximum in Neanderthals with an average size of 1,200–1,900 cm³ (73–116 cu in), larger even than *Homo sapiens* (but less encephalized).^[64] The pattern of human postnatal brain growth differs from that of other apes (heterochrony), and allows for extended periods of social learning and language acquisition in juvenile humans. However, the differences between the structure of human brains and those of other apes may be even more significant than differences in size.^{[65][66][67][68]} The increase in volume over time has affected different areas within the brain unequally—the temporal lobes, which contain centers for language processing have increased disproportionately, as has the prefrontal cortex which has been related to complex decision making and moderating social behavior.^[63] Encephalization has been tied to an increasing emphasis on meat in the diet,^{[69][70]} or with the development of cooking,^[71] and it has been proposed ^[72] that intelligence increased as a response to an increased necessity for solving social problems as human society became more complex.

The reduced degree of sexual dimorphism is primarily visible in the reduction of the male canine tooth relative to other ape species (except gibbons). Another important physiological change related to sexuality in humans was the evolution of hidden estrus. Humans are the only ape in which the female is intermittently fertile year round, and in which no special signals of fertility are produced by the body (such as genital swelling during estrus). Nonetheless humans retain a degree of sexual dimorphism in the distribution of body hair and subcutaneous fat, and in the overall size, males being around 25% larger than females. These changes taken together have been interpreted as a result of an increased emphasis on pair bonding as a possible solution to the requirement for increased parental investment due to the prolonged infancy of offspring.

Rise of *Homo sapiens*

By the beginning of the Upper Paleolithic period (50,000 BP), and likely significantly earlier by 100–70,000 years ago^{[17][18][15][16][19][20]} or possibly by about 300,000 years ago^{[23][22][21]} behavioral modernity, including language, music and other cultural universals had developed.^{[73][74]} As early *Homo sapiens* dispersed, it encountered varieties of archaic humans both in Africa and in Eurasia, in Eurasia notably *Homo neanderthalensis*. Since 2010, evidence for gene flow between archaic and modern humans during the period of roughly 100,000 to 30,000 years ago has been discovered. This includes modern human admixture in Neanderthals, Neanderthal admixture in all modern humans outside Africa,^{[75][76]} Denisova hominin admixture in Melanesians^[77] as well as admixture from unnamed archaic humans to some Sub-Saharan African populations.^[78]



World map of early human migrations according to mitochondrial population genetics (numbers are millennia before present, the North Pole is at the center).

The "out of Africa" migration of *Homo sapiens* took place in at least two waves, the first around 130,000 to 100,000 years ago, the second (Southern Dispersal) around 70,000 to 50,000 years ago,^{[79][80][81]} resulting in the colonization of Australia around 65–50,000 years ago,^{[82][83][84]} This recent out of Africa migration derived from East African populations, which had become separated from populations migrating to Southern, Central and Western Africa at least 100,000 years earlier.^[85] Modern humans subsequently spread globally, replacing archaic humans (either through competition or hybridization). They inhabited Eurasia and Oceania by 40,000 years ago, and the Americas at least 14,500 years ago.^{[86][87]}

Transition to modernity

Until about 12,000 years ago (the beginning of the Holocene), all humans lived as hunter-gatherers, generally in small nomadic groups known as band societies, often in caves.

The Neolithic Revolution (the invention of agriculture) took place beginning about 10,000 years ago, first in the Fertile Crescent, spreading through large parts of the Old World over the following millennia, and independently in Mesoamerica about 6,000 years ago. Access to food surplus led to the formation of permanent human settlements, the domestication of animals and the use of metal tools for the first time in history.



The rise of agriculture, and domestication of animals, led to stable human settlements.

Agriculture and sedentary lifestyle led to the emergence of early civilizations (the development of urban development, complex society, social stratification and writing) from about 5,000 years ago (the Bronze Age), first beginning in Mesopotamia.^[88]

Few human populations progressed to historicity, with substantial parts of the world remaining in a Neolithic, Mesolithic or Upper Paleolithic stage of development until the advent of globalisation and modernity initiated by European exploration and colonialism.

The Scientific Revolution, Technological Revolution and the Industrial Revolution brought such discoveries as imaging technology, major innovations in transport, such as the airplane and automobile; energy development, such as coal and electricity.^[89] This correlates with population growth (especially in America)^[90] and higher life expectancy, the World population rapidly increased numerous times in the 19th and 20th centuries as nearly 10% of the 100 billion people who ever lived lived in the past century.^[91]

With the advent of the Information Age at the end of the 20th century, modern humans live in a world that has become increasingly globalized and interconnected. As of 2010, almost 2 billion humans are able to communicate with each other via the Internet,^[92] and 3.3 billion by mobile phone subscriptions.^[93] Although connection between humans has encouraged the growth of science, art, discussion, and technology, it has also led to culture clashes and the development and use of weapons of mass destruction. Human population growth and industrialisation has led to environmental destruction and pollution significantly contributing to the ongoing mass extinction of other forms of life called the Holocene extinction event,^[94] which may be further accelerated by global warming in the future.^[95]

Habitat and population

Early human settlements were dependent on proximity to water and, depending on the lifestyle, other natural resources used for subsistence, such as populations of animal prey for hunting and arable land for growing crops and grazing livestock. However, modern humans have a great capacity for altering their habitats by means of technology, through irrigation, urban planning, construction, transport, manufacturing goods, deforestation and desertification,^[96] but human settlements continue to be vulnerable to natural disasters, especially those placed in hazardous locations and characterized by lack of quality of construction.^[97] Deliberate habitat alteration is often done with the goals of increasing material wealth, increasing thermal comfort, improving the amount of food available, improving aesthetics, or improving ease of access to resources or other human settlements. With the advent of large-scale trade and transport infrastructure, proximity to these resources has become unnecessary, and in many places, these factors are no longer a driving force behind the growth and decline of a population. Nonetheless, the manner in which a habitat is altered is often a major determinant in population change.

Technology has allowed humans to colonize six of the Earth's seven continents and adapt to virtually all climates. However the human population is not uniformly distributed on the Earth's surface, because the population density varies from one region to another and there are large areas almost completely uninhabited, like Antarctica.^{[98][99]} Within the last century, humans have explored Antarctica, underwater environment, and outer space, although large-scale colonization of these environments is not yet feasible. With a population of over seven billion, humans are among the most numerous of the large mammals. Most humans (61%) live in Asia. The remainder live in the Americas (14%), Africa (14%), Europe (11%), and Oceania (0.5%).^[100]

Human habitation within closed ecological systems in hostile environments, such as Antarctica and outer space, is expensive, typically limited in duration, and restricted to scientific, military, or industrial expeditions. Life in space has been very sporadic, with no more than thirteen humans in space at any given time.^[101] Between 1969 and 1972, two humans at a time spent brief intervals on the Moon. As of July 2020, no other celestial body has been visited by humans, although there has been a continuous human presence in space since the launch of the initial crew to inhabit the International Space Station on 31 October 2000.^[102] However, other celestial bodies have been visited by human-made objects.^{[103][104][105]}



The Earth, as seen from space in 2016, showing the extent of human occupation of the planet. The bright lights signify both the most densely inhabited areas and ones financially capable of illuminating those areas.



Tokyo, the world's largest metropolitan area, is an example of a mass human settlement called a city

Since 1800, the human population has increased from one billion^[106] to over seven billion.^[107] The combined biomass of the carbon of all the humans on Earth in 2018 was estimated at ~ 60 million tons, about 10 times larger than that of all non-domesticated mammals.^[108]

In 2004, some 2.5 billion out of 6.3 billion people (39.7%) lived in urban areas. In February 2008, the U.N. estimated that half the world's population would live in urban areas by the end of the year.^[109] Problems for humans living in cities include various forms of pollution and crime,^[110] especially in inner city and suburban slums. Both overall population numbers and the proportion residing in cities are expected to increase significantly in the coming decades.^[111]

Humans have had a dramatic effect on the environment. Humans are apex predators, being rarely preyed upon by other species.^[112] Currently, through land development, combustion of fossil fuels, and pollution, humans are thought to be the main contributor to global climate change.^[113] If this continues at its current rate it is predicted that climate change will wipe out half of all plant and animal species over the next century.^{[114][115]}

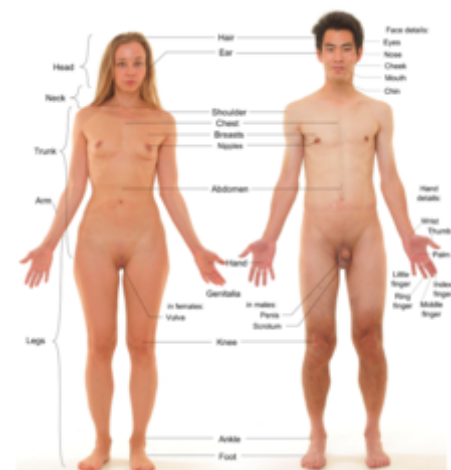
Biology

Anatomy and physiology

Most aspects of human physiology are closely homologous to corresponding aspects of animal physiology. The human body consists of the legs, the torso, the arms, the neck, and the head. An adult human body consists of about 100 trillion (10^{14}) cells. The most commonly defined body systems in humans are the nervous, the cardiovascular, the circulatory, the digestive, the endocrine, the immune, the integumentary, the lymphatic, the musculoskeletal, the reproductive, the respiratory, and the urinary system.^{[116][117]}

Humans, like most of the other apes, lack external tails, have several blood type systems, have opposable thumbs, and are sexually dimorphic. The comparatively minor anatomical differences between humans and chimpanzees are largely a result of human bipedalism and larger brain size. One difference is that humans have a far faster and more accurate throw than other animals. Humans are also among the best long-distance runners in the animal kingdom, but slower over short distances.^{[118][119]} Humans' thinner body hair and more productive sweat glands help avoid heat exhaustion while running for long distances.^[120]

As a consequence of bipedalism, human females have narrower birth canals. The construction of the human pelvis differs from other primates, as do the toes. A trade-off for these advantages of the modern human pelvis is that childbirth is more difficult and dangerous than in most mammals, especially given the larger head size of human babies compared to other primates. Human babies must turn around as they pass through the birth canal while other primates do not, which makes humans the only species where females usually require help from their conspecifics (other members of their own species) to reduce the risks of birthing. As a partial evolutionary solution, human fetuses are born less developed and more vulnerable. Chimpanzee babies are cognitively more developed than human babies until the age of six months, when the rapid development of human brains surpasses chimpanzees. Another difference between women and chimpanzee



Basic anatomical features of female and male humans. These models have had body hair and male facial hair removed and head hair trimmed. The female model is wearing red nail polish on her toenails and a ring.

females is that women go through the menopause and become infertile decades before the end of their lives. All species of non-human apes are capable of giving birth until death. Menopause probably developed as it provides an evolutionary advantage of more caring time to relatives' young.^[119]

Apart from bipedalism, humans differ from chimpanzees mostly in smelling, hearing, digesting proteins, brain size, and the ability of language. Humans' brains are about three times bigger than in chimpanzees. More importantly, the brain to body ratio is much higher in humans than in chimpanzees, and humans have a significantly more developed cerebral cortex, with a larger number of neurons. The mental abilities of humans are remarkable compared to other apes. Humans' ability of speech is unique among primates. Humans are able to create new and complex ideas, and to develop technology, which is unprecedented among other organisms on Earth.^[119]

It is estimated that the worldwide average height for an adult human male is about 172 cm (5 ft 7½ in), while the worldwide average height for adult human females is about 158 cm (5 ft 2 in). Shrinkage of stature may begin in middle age in some individuals, but tends to be typical in the extremely aged.^[121] Through history human populations have universally become taller, probably as a consequence of better nutrition, healthcare, and living conditions.^[122] The average mass of an adult human is 54–64 kg (119–141 lb) for females and 70–83 kg (154–183 lb) for males.^{[123][124]} Like many other conditions, body weight and body type is influenced by both genetic susceptibility and environment and varies greatly among individuals. (see obesity)^{[125][126]}

Humans have a density of hair follicles comparable to other apes. However, human body hair is vellus hair, most of which is so short and wispy as to be practically invisible. In contrast (and unusually among species), a follicle of terminal hair on the human scalp can grow for many years before falling out.^{[127][128]} Humans have about 2 million sweat glands spread over their entire bodies, many more than chimpanzees, whose sweat glands are scarce and are mainly located on the palm of the hand and on the soles of the feet.^[129] Humans have the largest number of eccrine sweat glands among species.

The dental formula of humans is: $\frac{2.1.2.3}{2.1.2.3}$. Humans have proportionately shorter palates and much smaller teeth than other primates. They are the only primates to have short, relatively flush canine teeth. Humans have characteristically crowded teeth, with gaps from lost teeth usually closing up quickly in young individuals. Humans are gradually losing their third molars, with some individuals having them congenitally absent.^[130]

Genetics

Like all animals, humans are a diploid eukaryotic species. Each somatic cell has two sets of 23 chromosomes, each set received from one parent; gametes have only one set of chromosomes, which is a mixture of the two parental sets. Among the 23 pairs of chromosomes there are 22 pairs of autosomes and one pair of sex chromosomes. Like other mammals, humans have an XY sex-determination system, so that females have the sex chromosomes XX and males have XY.^[131]

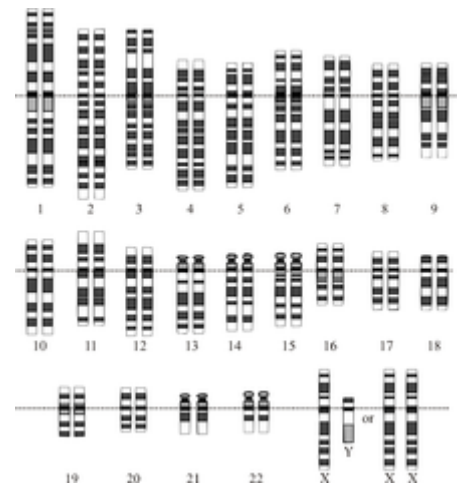
A rough and incomplete human genome was assembled as an average of a number of humans in 2003, and currently efforts are being made to achieve a sample of the genetic diversity of the species (see International HapMap Project). By present estimates, humans have approximately 22,000 genes.^[132] The variation in human DNA is very small compared to other species, possibly suggesting a population bottleneck during the Late Pleistocene (around 100,000 years ago), in which the human population was reduced to a small number of breeding pairs.^{[133][134]} Nucleotide diversity is based on single mutations called single nucleotide polymorphisms (SNPs). The nucleotide diversity between humans is about 0.1%, i.e. 1 difference per 1,000 base pairs.^{[135][136]} A difference of 1 in 1,000 nucleotides between two humans chosen at random amounts to about 3 million nucleotide differences, since the human genome has about 3 billion nucleotides. Most of

these single nucleotide polymorphisms (SNPs) are neutral but some (about 3 to 5%) are functional and influence phenotypic differences between humans through alleles.

By comparing the parts of the genome that are not under natural selection and which therefore accumulate mutations at a fairly steady rate, it is possible to reconstruct a genetic tree incorporating the entire human species since the last shared ancestor. Each time a certain mutation (SNP) appears in an individual and is passed on to his or her descendants, a haplogroup is formed including all of the descendants of the individual who will also carry that mutation. By comparing mitochondrial DNA, which is inherited only from the mother, geneticists have concluded that the last female common ancestor whose genetic marker is found in all modern humans, the so-called mitochondrial Eve, must have lived around 90,000 to 200,000 years ago.^{[137][138][139]}

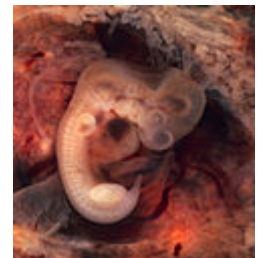
Human accelerated regions, first described in August 2006,^{[140][141]} are a set of 49 segments of the human genome that are conserved throughout vertebrate evolution but are strikingly different in humans. They are named according to their degree of difference between humans and their nearest animal relative (chimpanzees) (HAR1 showing the largest degree of human-chimpanzee differences). Found by scanning through genomic databases of multiple species, some of these highly mutated areas may contribute to human-specific traits.

The forces of natural selection have continued to operate on human populations, with evidence that certain regions of the genome display directional selection in the past 15,000 years.^[142]



A graphical representation of the standard human karyotype, including both the male (XY) and female (XX) sex chromosomes.

Life cycle



A 10 mm human embryo at 5 weeks



Boy and girl before puberty



Adolescent male and female



Adult man and woman



Elderly man and woman

As with other mammals, human reproduction takes place by internal fertilization via sexual intercourse. During this process, the male inserts his erect penis into the female's vagina and ejaculates semen, which contains sperm. The sperm travels through the vagina and cervix into the uterus or Fallopian tubes for fertilization of the ovum. Upon fertilization and implantation, gestation then occurs within the female's uterus.

The zygote divides inside the female's uterus to become an embryo, which over a period of 38 weeks (9 months) of gestation becomes a fetus. After this span of time, the fully grown fetus is birthed from the woman's body and breathes independently as an infant for the first time. At this point, most modern cultures recognize the baby as a person entitled to the full protection of the law, though some jurisdictions extend various levels of personhood earlier to human fetuses while they remain in the uterus.

Compared with other species, human childbirth is dangerous. Painful labors lasting 24 hours or more are not uncommon and sometimes lead to the death of the mother, the child or both.^[143] This is because of both the relatively large fetal head circumference and the mother's relatively narrow pelvis.^{[144][145]} The chances of a

successful labor increased significantly during the 20th century in wealthier countries with the advent of new medical technologies. In contrast, pregnancy and natural childbirth remain hazardous ordeals in developing regions of the world, with maternal death rates approximately 100 times greater than in developed countries.^[146]

In developed countries, infants are typically 3–4 kg (7–9 lb) in weight and 50–60 cm (20–24 in) in height at birth.^[147] However, low birth weight is common in developing countries, and contributes to the high levels of infant mortality in these regions.^[148] Helpless at birth, humans continue to grow for some years, typically reaching sexual maturity at 12 to 15 years of age. Females continue to develop physically until around the age of 18, whereas male development continues until around age 21. The human life span can be split into a number of stages: infancy, childhood, adolescence, young adulthood, adulthood and old age. The lengths of these stages, however, have varied across cultures and time periods. Compared to other primates, humans experience an unusually rapid growth spurt during adolescence, where the body grows 25% in size. Chimpanzees, for example, grow only 14%, with no pronounced spurt.^[149] The presence of the growth spurt is probably necessary to keep children physically small until they are psychologically mature. Humans are one of the few species in which females undergo menopause. It has been proposed that menopause increases a woman's overall reproductive success by allowing her to invest more time and resources in her existing offspring, and in turn their children (the grandmother hypothesis), rather than by continuing to bear children into old age.^{[150][151]}

Evidence-based studies indicate that the life span of an individual depends on two major factors, genetics and lifestyle choices.^[152] For various reasons, including biological/genetic causes,^[153] women live on average about four years longer than men—as of 2013 the global average life expectancy at birth of a girl is estimated at 70.2 years compared to 66.1 for a boy.^[154] There are significant geographical variations in human life expectancy, mostly correlated with economic development—for example life expectancy at birth in Hong Kong is 84.8 years for girls and 78.9 for boys, while in Swaziland, primarily because of AIDS, it is 31.3 years for both sexes.^[155] The developed world is generally aging, with the median age around 40 years. In the developing world the median age is between 15 and 20 years. While one in five Europeans is 60 years of age or older, only one in twenty Africans is 60 years of age or older.^[156] The number of centenarians (humans of age 100 years or older) in the world was estimated by the United Nations at 210,000 in 2002.^[157] Jeanne Calment is widely believed to have reached the age of 122;^[158] higher ages have been claimed but are unsubstantiated.

Diet

Humans are omnivorous, capable of consuming a wide variety of plant and animal material.^{[159][160]} Varying with available food sources in regions of habitation, and also varying with cultural and religious norms, human groups have adopted a range of diets, from purely vegan to primarily carnivorous. In some cases, dietary restrictions in humans can lead to deficiency diseases; however, stable human groups have adapted to many dietary patterns through both genetic specialization and cultural conventions to use nutritionally balanced food sources.^[161] The human diet is prominently reflected in human culture, and has led to the development of food science.



Humans living in Bali, Indonesia preparing a meal.

Until the development of agriculture approximately 10,000 years ago, *Homo sapiens* employed a hunter-gatherer method as their sole means of food collection. This involved combining stationary food sources (such as fruits, grains, tubers, and mushrooms, insect larvae and aquatic mollusks) with wild game, which must be hunted and killed in order to be consumed.^[162] It has been

proposed that humans have used fire to prepare and cook food since the time of Homo erectus.^[163] Around ten thousand years ago, humans developed agriculture,^[164] which substantially altered their diet. This change in diet may also have altered human biology; with the spread of dairy farming providing a new and rich source of food, leading to the evolution of the ability to digest lactose in some adults.^{[165][166]} Agriculture led to increased populations, the development of cities, and because of increased population density, the wider spread of infectious diseases. The types of food consumed, and the way in which they are prepared, have varied widely by time, location, and culture.

In general, humans can survive for two to eight weeks without food, depending on stored body fat. Survival without water is usually limited to three or four days. About 36 million humans die every year from causes directly or indirectly related to starvation.^[167] Childhood malnutrition is also common and contributes to the global burden of disease.^[168] However global food distribution is not even, and obesity among some human populations has increased rapidly, leading to health complications and increased mortality in some developed, and a few developing countries. Worldwide over one billion people are obese,^[169] while in the United States 35% of people are obese, leading to this being described as an "obesity epidemic."^[170] Obesity is caused by consuming more calories than are expended, so excessive weight gain is usually caused by an energy-dense diet.^[169]

Biological variation

No two humans—not even monozygotic twins—are genetically identical. Genes and environment influence human biological variation in visible characteristics, physiology, disease susceptibility and mental abilities. The exact influence of genes and environment on certain traits is not well understood.^{[171][172]}

Most current genetic and archaeological evidence supports a recent single origin of modern humans in East Africa,^[173] with first migrations placed at 60,000 years ago. Compared to the great apes, human gene sequences—even among African populations—are remarkably homogeneous.^[174] On average, genetic similarity between any two humans is 99.5%-99.9%.^{[175][176][177][178][179][180]} There is about 2–3 times more genetic diversity within the wild chimpanzee population than in the entire human gene pool.^{[181][182][183]}

The human body's ability to adapt to different environmental stresses is remarkable, allowing humans to acclimatize to a wide variety of temperatures, humidity, and altitudes. As a result, humans are a cosmopolitan species found in almost all regions of the world, including tropical rainforest, arid desert, extremely cold arctic regions, and heavily polluted cities. Most other species are confined to a few geographical areas by their limited adaptability.^[184]

There is biological variation in the human species—with traits such as blood type, genetic diseases, cranial features, facial features, organ systems, eye color, hair color and texture, height and build, and skin color varying across the globe. Human body types vary substantially. The typical height of an adult human is between 1.4 and 1.9 m (4 ft 7 in and 6 ft 3 in), although this varies significantly depending, among other things, on sex, ethnic origin,^{[185][186]} and



People in hot climates are often slender, lanky, and dark skinned, such as these Maasai men from Kenya.



According to Allen's rule, people in cold climates tend to be shorter, lighter skinned, and stockier, such as these Inuit women from Canada.

even family bloodlines. Body size is partly determined by genes and is also significantly influenced by environmental factors such as diet, exercise, and sleep patterns, especially as an influence in childhood. Adult height for each sex in a particular ethnic group approximately follows a normal distribution. Those aspects of genetic variation that give clues to human evolutionary history, or are relevant to medical research, have received particular attention. For example, the genes that allow adult humans to digest lactose are present in high frequencies in populations that have long histories of cattle domestication, suggesting natural selection having favored that gene in populations that depend on cow milk. Some hereditary diseases such as sickle cell anemia are frequent in populations where malaria has been endemic throughout history—it is believed that the same gene gives increased resistance to malaria among those who are unaffected carriers of the gene. Similarly, populations that have for a long time inhabited specific climates, such as arctic or tropical regions or high altitudes, tend to have developed specific phenotypes that are beneficial for conserving energy in those environments—short stature and stocky build in cold regions, tall and lanky in hot regions, and with high lung capacities at high altitudes. Some populations have evolved highly unique adaptations to very specific environmental conditions, such as those advantageous to ocean-dwelling lifestyles and freediving in the Bajau.^[187] Skin color tends to vary clinally, with darker skin mostly around the equator—where the added protection from the sun's ultraviolet radiation is thought to give an evolutionary advantage—and lighter skin tones closer to the poles.^{[188][189][190][191]}

The hue of human skin and hair is determined by the presence of pigments called melanins. Human skin color can range from darkest brown to lightest peach, or even nearly white or colorless in cases of albinism.^[183] Human hair ranges in color from white to red to blond to brown to black, which is most frequent.^[192] Hair color depends on the amount of melanin (an effective sun blocking pigment) in the skin and hair, with hair melanin concentrations in hair fading with increased age, leading to grey or even white hair. Most researchers believe that skin darkening is an adaptation that evolved as protection against ultraviolet solar radiation, which also helps balancing folate, which is destroyed by ultraviolet radiation. Light skin pigmentation protects against depletion of vitamin D, which requires sunlight to make.^[193] Skin pigmentation of contemporary humans is clinally distributed across the planet, and in general correlates with the level of ultraviolet radiation in a particular geographic area. Human skin also has a capacity to darken (tan) in response to exposure to ultraviolet radiation.^{[194][195][196]}

Structure of variation

Within the human species, the greatest degree of genetic variation exists between males and females. While the nucleotide genetic variation of individuals of the same sex across global populations is no greater than 0.1%-0.5%, the genetic difference between males and females is between 1% and 2%. The genetic difference between sexes contributes to anatomical, hormonal, neural, and physiological differences between men and women, although the exact degree and nature of social and environmental influences on sexes are not completely understood. Males on average are 15% heavier and 15 cm (6 in) taller than females. There is a difference between body types, body organs and systems, hormonal levels, sensory systems, and muscle mass between sexes. On average, men have about 40–50% more upper body strength and 20–30% more lower body strength than women. Women generally have a higher body fat percentage than men. Women have lighter skin than men of the same population; this has been explained by a higher need for vitamin D (which is synthesized by sunlight) in females during pregnancy and lactation. As there are chromosomal differences between females and males, some X and Y chromosome related conditions and disorders only affect either men or women. Other conditional differences between males and



A Libyan, a Nubian, a Syrian, and an Egyptian, drawing by an unknown artist after a mural of the tomb of Seti I.

females are not related to sex chromosomes. Even after allowing for body weight and volume, the male voice is usually an octave deeper than the female voice. Women have a longer life span in almost every population around the world.^{[197][198][199][200][201][202][203][204][205]}

Males typically have larger tracheae and branching bronchi, with about 30% greater lung volume per unit body mass. They have larger hearts, 10% higher red blood cell count, and higher hemoglobin, hence greater oxygen-carrying capacity. They also have higher circulating clotting factors (vitamin K, prothrombin and platelets). These differences lead to faster healing of wounds and higher peripheral pain tolerance.^[206] Females typically have more white blood cells (stored and circulating), more granulocytes and B and T lymphocytes. Additionally, they produce more antibodies at a faster rate than males. Hence they develop fewer infectious diseases and these continue for shorter periods.^[206] Ethologists argue that females, interacting with other females and multiple offspring in social groups, have experienced such traits as a selective advantage.^{[207][208][209][210][211]} According to Daly and Wilson, "The sexes differ more in human beings than in monogamous mammals, but much less than in extremely polygamous mammals."^[212] But given that sexual dimorphism in the closest relatives of humans is much greater than among humans, the human clade must be considered to be characterized by decreasing sexual dimorphism, probably due to less competitive mating patterns. One proposed explanation is that human sexuality has developed more in common with its close relative the bonobo, which exhibits similar sexual dimorphism, is polygynandrous and uses recreational sex to reinforce social bonds and reduce aggression.^[213]



A Yanomami woman and child



An older adult human male
European in Paris – playing chess
at the Jardin du Luxembourg.

Humans of the same sex are 99.5% genetically identical. There is relatively little variation between human geographical populations, and most of the variation that occurs is at the individual level.^{[183][214][215]} Of the 0.1%-0.5% of human genetic differentiation, 85% exists within any randomly chosen local population, be they Italians, Koreans, or Kurds. Two randomly chosen Koreans may be genetically almost as different as a Korean and an Italian. Genetic data shows that no matter how population groups are defined, two people from the same population group are almost as different from each other as two people from any two different population groups.^{[183][216][217][218]}

Current genetic research has demonstrated that human populations native to the African continent are the most genetically diverse.^[219] Human genetic diversity decreases in native populations with migratory distance from Africa, and this is thought to be the result of bottlenecks during human migration.^{[220][221]} Humans have lived in Africa for the longest time, which has allowed accumulation of a higher diversity of genetic mutations in these populations. Only part of Africa's population migrated out of the continent into Eurasia, bringing just part of the original African genetic variety with them. Non-African populations, however, acquired new genetic inputs from local admixture with archaic populations, and thus have much larger amounts of variation from Neanderthals and Denisovans than is found in Africa.^[222] African populations also harbour the highest number of private genetic variants, or those not found in other places of the world. While many of the common variants found in populations outside of Africa are also found on the African continent, there are still large numbers which are private to these regions, especially Oceania and the Americas.^{[183][222]} Furthermore, recent studies have found that populations in sub-Saharan Africa, and

particularly West Africa, have ancestral genetic variation which predates modern humans and has been lost in most non-African populations. This ancestry is thought to originate from admixture with an unknown archaic hominin that diverged before the split of Neanderthals and modern humans.^{[223][224]}

Geographical distribution of human variation is complex and constantly shifts through time which reflects complicated human evolutionary history. Most human biological variation is clinally distributed and blends gradually from one area to the next. Groups of people around the world have different frequencies of polymorphic genes. Furthermore, different traits are often non-concordant and each have different clinal distribution. Adaptability varies both from person to person and from population to population. The most efficient adaptive responses are found in geographical populations where the environmental stimuli are the strongest (e.g. Tibetans are highly adapted to high altitudes). The clinal geographic genetic variation is further complicated by the migration and mixing between human populations which has been occurring since prehistoric times.^{[183][225][226][227][228][229]}

Human variation is highly non-concordant: many of the genes do not cluster together and are not inherited together. Skin and hair color are mostly not correlated to height, weight, or athletic ability. Humans do not share the same patterns of variation through geography. Skin colour generally varies with latitude and certain people are tall or have brown hair. There is a statistical correlation between particular features in a population, but different features might not be expressed or inherited together. Thus, genes which code for some physical traits—such as skin color, hair color, or height—represent a minuscule portion of the human genome and might not correlate with genetic affinity. Dark-skinned populations that are found in Africa, Australia, and South Asia are not closely related to each other.^{[196][228][229][230][231][232]} Even within the same region, physical phenotype can be unrelated to genetic affinity. Despite pygmy populations of South East Asia (Andamanese) having similar physical features with African pygmy populations such as short stature, dark skin, and curly hair, they are not genetically closely related to these populations.^[233] Genetic variants affecting superficial anatomical features such as skin color—from a genetic perspective, are highly meaningless—they involve a few hundred of the billions of nucleotides in a person's DNA.^[234] Individuals with the same morphology do not necessarily cluster with each other by lineage, and a given lineage does not include only individuals with the same trait complex.^{[183][217][235]}

Due to practices of group endogamy, allele frequencies cluster locally around kin groups and lineages, or by national, ethnic, cultural and linguistic boundaries, giving a detailed degree of correlation between genetic clusters and population groups when considering many alleles simultaneously. Despite this, genetic boundaries around local populations do not biologically mark off any fully discrete groups of humans. Much of human variation is continuous, often with no clear points of demarcation.^{[235][236][227][228][237][238][239][240][241][242]}

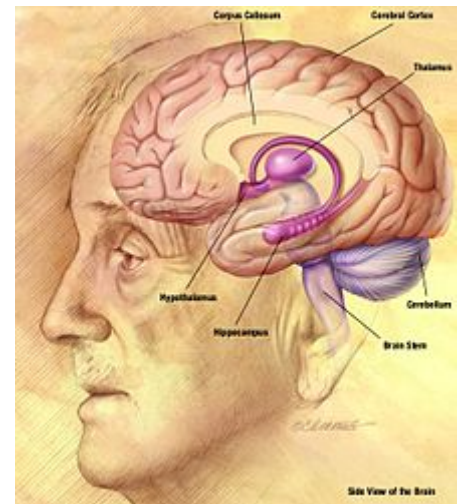
Psychology

The human brain, the focal point of the central nervous system in humans, controls the peripheral nervous system. In addition to controlling "lower," involuntary, or primarily autonomic activities such as respiration and digestion, it is also the locus of "higher" order functioning such as thought, reasoning, and abstraction.^[243] These cognitive processes constitute the mind, and, along with their behavioral consequences, are studied in the field of psychology.

Generally regarded as more capable of these higher order activities, the human brain is believed to be more intelligent in general than that of any other known species. While some non-human species are capable of creating structures and using simple tools—mostly through instinct and mimicry—human technology is vastly more complex, and is constantly evolving and improving through time.

Sleep and dreaming

Humans are generally diurnal. The average sleep requirement is between seven and nine hours per day for an adult and nine to ten hours per day for a child; elderly people usually sleep for six to seven hours. Having less sleep than this is common among humans, even though sleep deprivation can have negative health effects. A sustained restriction of adult sleep to four hours per day has been shown to correlate with changes in physiology and mental state, including reduced memory, fatigue, aggression, and bodily discomfort.^[244] During sleep humans dream. In dreaming humans experience sensory images and sounds, in a sequence which the dreamer usually perceives more as an apparent participant than as an observer. Dreaming is stimulated by the pons and mostly occurs during the REM phase of sleep.



Drawing of the human brain, showing several important structures

Consciousness and thought

Humans are one of the relatively few species to have sufficient self-awareness to recognize themselves in a mirror.^[245] Around 18 months most human children are aware that the mirror image is not another person.^[246]

The human brain perceives the external world through the senses, and each individual human is influenced greatly by his or her experiences, leading to subjective views of existence and the passage of time. Humans are variously said to possess consciousness, self-awareness, and a mind, which correspond roughly to the mental processes of thought. These are said to possess qualities such as self-awareness, sentience, sapience, and the ability to perceive the relationship between oneself and one's environment. The extent to which the mind constructs or experiences the outer world is a matter of debate, as are the definitions and validity of many of the terms used above.

The physical aspects of the mind and brain, and by extension of the nervous system, are studied in the field of neurology, the more behavioral in the field of psychology, and a sometimes loosely defined area between in the field of psychiatry, which treats mental illness and behavioral disorders. Psychology does not necessarily refer to the brain or nervous system, and can be framed purely in terms of phenomenological or information processing theories of the mind. Increasingly, however, an understanding of brain functions is being included in psychological theory and practice, particularly in areas such as artificial intelligence, neuropsychology, and cognitive neuroscience.

The nature of thought is central to psychology and related fields. Cognitive psychology studies cognition, the mental processes underlying behavior. It uses information processing as a framework for understanding the mind. Perception, learning, problem solving, memory, attention, language and emotion are all well researched areas as well. Cognitive psychology is associated with a school of thought known as cognitivism, whose adherents argue for an information processing model of mental function, informed by positivism and experimental psychology. Techniques and models from cognitive psychology are widely applied and form the mainstay of psychological theories in many areas of both research and applied psychology. Largely focusing on the development of the human mind through the life span, developmental psychology seeks to understand how people come to perceive, understand, and act within the world and how these processes change as they age. This may focus on intellectual, cognitive, neural, social, or moral development. Psychologists have developed intelligence tests and the concept of intelligence quotient in order to assess the relative intelligence of human beings and study its distribution among population.^[247]

Some philosophers divide consciousness into phenomenal consciousness, which is experience itself, and access consciousness, which is the processing of the things in experience.^[248] Phenomenal consciousness is the state of being conscious, such as when they say "I am conscious." Access consciousness is being

conscious of something in relation to abstract concepts, such as when one says "I am conscious of these words." Various forms of access consciousness include awareness, self-awareness, conscience, stream of consciousness, Husserl's phenomenology, and intentionality. The concept of phenomenal consciousness, in modern history, according to some, is closely related to the concept of qualia. Social psychology links sociology with psychology in their shared study of the nature and causes of human social interaction, with an emphasis on how people think towards each other and how they relate to each other. The behavior and mental processes, both human and non-human, can be described through animal cognition, ethology, evolutionary psychology, and comparative psychology as well. Human ecology is an academic discipline that investigates how humans and human societies interact with both their natural environment and the human social environment.

Motivation and emotion

Human motivation is not yet wholly understood. From a psychological perspective, Maslow's hierarchy of needs is a well-established theory which can be defined as the process of satisfying certain needs in ascending order of complexity.^[249] From a more general, philosophical perspective, human motivation can be defined as a commitment to, or withdrawal from, various goals requiring the application of human ability. Furthermore, incentive and preference are both factors, as are any perceived links between incentives and preferences. Volition may also be involved, in which case willpower is also a factor. Ideally, both motivation and volition ensure the selection, striving for, and realization of goals in an optimal manner, a function beginning in childhood and continuing throughout a lifetime in a process known as socialization.^[250]

Happiness, or the state of being happy, is a human emotional condition. The definition of happiness is a common philosophical topic. Some people might define it as the best condition that a human can have—a condition of mental and physical health. Others define it as freedom from want and distress; consciousness of the good order of things; assurance of one's place in the universe or society.

Emotion has a significant influence on, or can even be said to control, human behavior, though historically many cultures and philosophers have for various reasons discouraged allowing this influence to go unchecked. Emotional experiences perceived as pleasant, such as love, admiration, or joy, contrast with those perceived as unpleasant, like hate, envy, or sorrow. The Stoics believed excessive emotion was harmful, while some Sufi teachers felt certain extreme emotions could yield a conceptual perfection, what is often translated as ecstasy.

In modern scientific thought, certain refined emotions are considered a complex neural trait innate in a variety of domesticated and non-domesticated mammals. These were commonly developed in reaction to superior survival mechanisms and intelligent interaction with each other and the environment; as such, refined emotion is not in all cases as discrete and separate from natural neural function as was once assumed. However, when humans function in civilized tandem, it has been noted that uninhibited acting on extreme emotion can lead to social disorder and crime.

Sexuality and love



Illustration of grief from Charles Darwin's book *The Expression of the Emotions in Man and Animals*.

For humans, sexuality has important social functions: it creates physical intimacy, bonds and hierarchies among individuals, besides ensuring biological reproduction. Sexual desire, or *libido*, is experienced as a bodily urge, often accompanied by strong emotions such as love, *ecstasy* and *jealousy*. The significance of sexuality in the human species is reflected in a number of physical features, among them hidden *ovulation*, the evolution of external *scrotum* and (among great apes) a relatively large *penis* suggesting *sperm competition* in humans, the absence of an *os penis*, permanent *secondary sexual characteristics* and the forming of *pair bonds* based on sexual attraction as a common social structure. Contrary to other primates that often advertise *estrus* through visible signs, human females do not have distinct or visible signs of ovulation, and they experience sexual desire outside of their fertile periods.



Human parents continue caring for their offspring long after they are born.

Human choices in acting on sexuality are commonly influenced by social norms, which vary between cultures. Restrictions are often determined by religious beliefs or social customs. People can fall anywhere along a continuous scale of *sexual orientation*,^[251] although most humans are heterosexual.^[252] There is considerably more evidence supporting nonsocial, biological causes of sexual orientation than social ones, especially for males.^[252] Recent research, including *neurology* and *genetics*, suggests that other aspects of human sexuality are biologically influenced as well.^[253]

Both the mother and the father provide care for human offspring, in contrast to other primates, where parental care is mostly restricted to mothers.^[254]

Behavior



Humans often live in family-based social structures.

Humanity's unprecedented set of intellectual skills were a key factor in the species' eventual technological advancement and concomitant domination of the biosphere.^[259] Disregarding extinct hominids, humans are the only animals known to teach generalizable information,^[260] innately deploy recursive embedding to generate and communicate complex concepts,^[261] engage in the "folk physics" required for competent tool design,^{[262][263]} or cook food in the wild.^[264] Human traits and behaviors that are unusual (though not necessarily unique) among species, include starting fires,^[265] phoneme structuring,^[266] self-recognition in mirror tests,^[267] habitual bipedal walking,^[268] and vocal learning.^[269] Scholars debate whether humans evolved the unusual trait of natural persistence hunting,^{[270][271]}

Human society statistics	
World population ^[29]	7.8 billion
Population density ^{[29][255]}	15/km ² (40/sq mi) by total area 52/km ² (136/sq mi) by land area
Largest cities ^[256]	Tokyo, Delhi, Shanghai, Mumbai, São Paulo, Beijing, Mexico City, Osaka, Cairo, New York-Newark, Dhaka, Karachi, Buenos Aires, Kolkata, Istanbul, Chongqing, Lagos, Manila, Guangzhou, Rio de Janeiro, Los Angeles-Long Beach-Santa Ana, Moscow, Kinshasa, Tianjin, Paris, Shenzhen, Jakarta, Bangalore, London, Chennai, Lima
Most widely spoken native	Chinese, Spanish, English, Hindi, Arabic,

and also debate to what extent humans are the only animals with a theory of mind.^[272] Even compared with other social animals, humans have an unusually high degree of flexibility in their facial expressions.^[273] Humans are the only animals known to cry emotional tears.^[274]

Humans are highly social beings and tend to live in large complex social groups. More than any other creature, humans are capable of using systems of communication for self-expression, the exchange of ideas, and organization, and as such have created complex social structures composed of many cooperating and competing groups. Human groups range from the size of families to nations. Social interactions between humans have established an extremely wide variety of values, social norms, and rituals, which together form the basis of human society.

languages ^[257]	Portuguese, Bengali, Russian, Japanese, Javanese, German, Lahnda, Telugu, Marathi, Tamil, French, Vietnamese, Korean, Urdu, Italian, Indonesian, Persian, Turkish, Polish, Oriya, Burmese, Thai
Most popular religions ^[258]	Christianity, Islam, Hinduism, Buddhism, Sikhism, Judaism
GDP (nominal)	US\$36,356,240 million (US\$5,797 per capita)
GDP (PPP)	\$51,656,251 million <u>IND</u> (\$8,236 per capita)

Culture is defined here as patterns of complex symbolic behavior, i.e. all behavior that is not innate but which has to be learned through social interaction with others; such as the use of distinctive material and symbolic systems, including language, ritual, social organization, traditions, beliefs and technology.

Language

While many species communicate, language is unique to humans, a defining feature of humanity, and a cultural universal. Unlike the limited systems of other animals, human language is open—an infinite number of meanings can be produced by combining a limited number of symbols. Human language also has the capacity of displacement, using words to represent things and happenings that are not presently or locally occurring, but reside in the shared imagination of interlocutors.^[130] Language differs from other forms of communication in that it is modality independent; the same meanings can be conveyed through different media, auditively in speech, visually by sign language or writing, and even through tactile media such as braille. Language is central to the communication between humans, and to the sense of identity that unites nations, cultures and ethnic groups. The invention of writing systems at least five thousand years ago allowed the preservation of language on material objects, and was a major technological advancement. The science of linguistics describes the structure and function of language and the relationship between languages. There are approximately six thousand different languages currently in use, including sign languages, and many thousands more that are extinct.^[275]

Gender roles

The division of humans into male and female sexes has been marked culturally by a corresponding division of roles, norms, practices, dress, behavior, rights, duties, privileges, status, and power. Cultural differences by gender have often been believed to have arisen naturally out of a division of reproductive labor; the biological fact that women give birth led to their further cultural responsibility for nurturing and caring for children.^[276] Gender roles have varied historically, and challenges to predominant gender norms have recurred in many societies.

Kinship



Sessue Hayakawa (left) with actress and wife Tsuru Aoki in a screen shot of the 1919 film *The Dragon Painter*.

All human societies organize, recognize and classify types of social relationships based on relations between parents and children (consanguinity), and relations through marriage (affinity). These kinds of relations are generally called kinship relations. In most societies kinship places mutual responsibilities and expectations of solidarity on the individuals that are so related, and those who recognize each other as kinsmen come to form networks through which other social institutions can be regulated. Among the many functions of kinship is the ability to form descent groups, groups of people sharing a common line of descent, which can function as political units such as clans. Another function is the way in which kinship unites families through marriage, forming kinship alliances between groups of wife-takers and wife-givers. Such alliances also often have important political and economical ramifications, and may result in the formation of political organization above the

community level. Kinship relations often includes regulations for whom an individual should or shouldn't marry. All societies have rules of incest taboo, according to which marriage between certain kinds of kin relations are prohibited—such rules vary widely between cultures. Some societies also have rules of preferential marriage with certain kin relations, frequently with either cross or parallel cousins. Rules and norms for marriage and social behavior among kinsfolk is often reflected in the systems of kinship terminology in the various languages of the world. In many societies kinship relations can also be formed through forms of co-habitation, adoption, fostering, or companionship, which also tends to create relations of enduring solidarity (nurture kinship).

Ethnicity

Humans often form ethnic groups, such groups tend to be larger than kinship networks and be organized around a common identity defined variously in terms of shared ancestry and history, shared cultural norms and language, or shared biological phenotype. Such ideologies of shared characteristics are often perpetuated in the form of powerful, compelling narratives that give legitimacy and continuity to the set of shared values. Ethnic groupings often correspond to some level of political organization such as the band, tribe, city state or nation. Although ethnic groups appear and disappear through history, members of ethnic groups often conceptualize their groups as having histories going back into the deep past. Such ideologies give ethnicity a powerful role in defining social identity and in constructing solidarity between members of an ethno-political unit. This unifying property of ethnicity has been closely tied to the rise of the nation state as the predominant form of political organization in the 19th and 20th centuries.^{[277][278][279][280][281][282]}

Society, government, and politics

Society is the system of organizations and institutions arising from interaction between humans. Within a society people can be divided into different groups according to their income, wealth, power, reputation, etc., but the structure of social stratification and the degree of social mobility differs, especially between modern and traditional societies.^[283] A state is an organized political community occupying a definite territory, having an organized government, and possessing internal and external sovereignty. Recognition of the state's claim to independence by other states, enabling it to enter into international agreements, is often important to the establishment of its statehood. The "state" can also be defined in terms of domestic



The United Nations Headquarters in New York City, which houses one of the world's largest political organizations

conditions, specifically, as conceptualized by Max Weber, "a state is a human community that (successfully) claims the monopoly of the 'legitimate' use of physical force within a given territory."^[284]

Government can be defined as the political means of creating and enforcing laws; typically via a bureaucratic hierarchy. Politics is the process by which decisions are made within groups; this process often involves conflict as well as compromise. Although the term is generally applied to behavior within governments, politics is also observed in all human group interactions, including corporate, academic, and religious institutions. Many different political systems exist, as do many different ways of understanding them, and many definitions overlap. Examples of governments include monarchy, Communist state, military dictatorship, theocracy, and liberal democracy, the last of which is considered dominant today. All of these issues have a direct relationship with economics.

Trade and economics

Trade is the voluntary exchange of goods and services, and is a form of economic activity. A mechanism that allows trade is called a market. Modern traders instead generally negotiate through a medium of exchange, such as money. As a result, buying can be separated from selling, or earning. Because of specialization and division of labor, most people concentrate on a small aspect of manufacturing or service, trading their labor for products. Trade exists between regions because different regions have an absolute or comparative advantage in the production of some tradable commodity, or because different regions' size allows for the benefits of mass production.



Buyers and sellers bargaining in a market in Tengeru, Tanzania

Economics is a social science which studies the production, distribution, trade, and consumption of goods and services. Economics focuses on measurable variables, and is broadly divided into two main branches: microeconomics, which deals with individual agents, such as households and businesses, and macroeconomics, which considers the economy as a whole, in which case it considers aggregate supply and demand for money, capital and commodities. Aspects receiving particular attention in economics are resource allocation, production, distribution, trade, and competition. Economic logic is increasingly applied to any problem that involves choice under scarcity or determining economic value.

War

War is a state of organized armed conflict between states or non-state actors. War is characterized by the use of lethal violence against others—whether between combatants or upon non-combatants—to achieve military goals through force. Lesser, often spontaneous conflicts, such as brawls, riots, revolts, and melees, are not considered to be warfare. Revolutions can be nonviolent or an organized and armed revolution which denotes a state of war. During the 20th century, it is estimated that between 167 and 188 million people died as a result of war.^[285] A common definition defines war as a series of military campaigns between at least two opposing sides involving a dispute over sovereignty, territory, resources, religion, or other issues. A war between internal elements of a state is a civil war.



Men in period costume portraying soldiers during a 2011 reenactment of the Battle of Waterloo (1815)

There have been a wide variety of rapidly advancing tactics throughout the history of war, ranging from conventional war to asymmetric warfare to total war and unconventional warfare. Techniques include hand to hand combat, the use of ranged weapons, naval warfare, and, more recently, air support. Military intelligence has often played a key role in determining victory and defeat. Propaganda, which often includes information, slanted opinion and disinformation, plays a key role both in maintaining unity within a warring group and in sowing discord among opponents. In modern warfare, soldiers and combat vehicles are used to control the land, warships the sea, and aircraft the sky. These fields have also overlapped in the forms of marines, paratroopers, aircraft carriers, and surface-to-air missiles, among others. Satellites in low Earth orbit have made outer space a factor in warfare as well through their use for detailed intelligence gathering; however, no known aggressive actions have been taken from space.

Material culture and technology

Stone tools were used by proto-humans at least 2.5 million years ago.^[286] The controlled use of fire began around 1.5 million years ago. Since then, humans have made major advances, developing complex technology to create tools to aid their lives and allowing for other advancements in culture. Major leaps in technology include the discovery of agriculture—what is known as the Neolithic Revolution, and the invention of automated machines in the Industrial Revolution.



An array of Neolithic artifacts, including bracelets, axe heads, chisels, and polishing tools.

Archaeology attempts to tell the story of past or lost cultures in part by close examination of the artifacts they produced. Early humans left stone tools, pottery, and jewelry that are particular to various regions and times.

Body culture

Throughout history, humans have altered their appearance by wearing clothing^[287] and adornments, by trimming or shaving hair or by means of body modifications.

Body modification is the deliberate altering of the human body for any non-medical reason, such as aesthetics, sexual enhancement, a rite of passage, religious reasons, to display group membership or affiliation, to create body art, shock value, or self-expression.^[288] In its most broad definition it includes plastic surgery, socially acceptable decoration (e.g. common ear piercing in many societies), and religious rites of passage (e.g. circumcision in a number of cultures).^[288]

Philosophy and self-reflection

Philosophy is a discipline or field of study involving the investigation, analysis, and development of ideas at a general, abstract, or fundamental level. It is the discipline searching for a general understanding of reality, reasoning and values. Major fields of philosophy include logic, metaphysics, epistemology, philosophy of mind, and axiology (which includes ethics and aesthetics). Philosophy covers a very wide range of approaches, and is used to refer to a worldview, to a perspective on an issue, or to the positions argued for by a particular philosopher or school of philosophy.

Religion and spirituality

Religion is generally defined as a belief system concerning the supernatural, sacred or divine, and practices, values, institutions and rituals associated with such belief. Some religions also have a moral code. The evolution and the history of the first religions have recently become areas of active scientific investigation.^{[289][290][291]} However, in the course of its development, religion has taken on many forms that vary by culture and individual perspective. Some of the chief questions and issues religions are concerned with include life after death (commonly involving belief in an afterlife), the origin of life, the nature of the universe (religious cosmology) and its ultimate fate (eschatology), and what is moral or immoral. A common source for answers to these questions are beliefs in transcendent divine beings such as deities or a singular God, although not all religions are theistic. Spirituality, belief or involvement in matters of the soul or spirit, is one of the many different approaches humans take in trying to answer fundamental questions about humankind's place in the universe, the meaning of life, and the ideal way to live one's life. Though these topics have also been addressed by philosophy, and to some extent by science, spirituality is unique in that it focuses on mystical or supernatural concepts such as karma and God.



Statue of Confucius on Chongming Island in Shanghai

Although the exact level of religiosity can be hard to measure,^[292] a majority of humans professes some variety of religious or spiritual belief, although many (in some countries a majority) are irreligious. This includes humans who have no religious beliefs or do not identify with any religion. Humanism is a philosophy which seeks to include all of humanity and all issues common to humans; it is usually non-religious. Most religions and spiritual beliefs are clearly distinct from science on both a philosophical and methodological level; the two are not generally considered mutually exclusive and a majority of humans hold a mix of both scientific and religious views. The distinction between philosophy and religion, on the other hand, is at times less clear, and the two are linked in such fields as the philosophy of religion and theology.

Art, music, and literature

Humans have been producing art works for at least seventy-three thousand years.^[293] Art may be defined as a form of cultural expression and the usage of narratives of liberation and exploration (i.e. art history, art criticism, and art theory) to mediate its boundaries. This distinction may be applied to objects or performances, current or historical, and its prestige extends to those who made, found, exhibit, or own them. In the modern use of the word, art is commonly understood to be the process or result of making material works that, from concept to creation, adhere to the "creative impulse" of human beings.

Music is a natural intuitive phenomenon based on the three distinct and interrelated organization structures of rhythm, harmony, and melody. Listening to music is perhaps the most common and universal form of entertainment, while learning and understanding it are popular disciplines. There are a wide variety of music genres and ethnic musics. Literature, the body of written—and possibly oral—works, especially creative ones, includes prose, poetry and drama, both fiction and non-fiction. Literature includes such genres as epic, legend, myth, ballad, and folklore.



Allegory of Music (c. 1594), a painting of a woman writing sheet music by Lorenzo Lippi

Science

Another unique aspect of human culture and thought is the development of complex methods for acquiring knowledge through observation, quantification, and verification.^{[294][295]} The scientific method has been developed to acquire knowledge of the physical world and the rules, processes and principles of which it consists, and combined with mathematics it enables the prediction of complex patterns of causality and consequence. An understanding of mathematics is unique to humans, although other species of animal have some numerical cognition.^[296]

All of science can be divided into three major branches, the formal sciences (e.g., logic and mathematics), which are concerned with formal systems, the applied sciences (e.g., engineering, medicine), which are focused on practical applications, and the empirical sciences, which are based on empirical observation and are in turn divided into natural sciences (e.g., physics, chemistry, biology) and social sciences (e.g., psychology, economics, sociology).^[297] A pseudoscience is an activity or a teaching which is mistakenly regarded as being scientific by its major proponents.^[298]

See also

- Human nature
- Holocene calendar
- Human impact on the environment
- Human timeline
- Life timeline
- List of human evolution fossils
- Nature timeline

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Further reading

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- Reich, David (2018). *Who We Are And How We Got Here – Ancient DNA and the New Science of the Human Past*. Pantheon Books. ISBN 978-1101870327.

External links

- Archaeology Info (<http://www.archaeologyinfo.com/homosapiens.htm>)
- Homo sapiens (<http://humanorigins.si.edu/evidence/human-fossils/species/homo-sapiens>) – The Smithsonian Institution's Human Origins Program
- "Homo sapiens Linnaeus, 1758" (<https://www.eol.org/pages/327955>) at the *Encyclopedia of Life*
- View the human genome (http://www.ensembl.org/Homo_sapiens/Info/Index) on Ensembl
- Human Timeline (Interactive) (<http://humanorigins.si.edu/evidence/human-evolution-timeline-interactive>) – Smithsonian, National Museum of Natural History (August 2016).
-  Media related to *Homo sapiens* at Wikimedia Commons

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